

WHAT IS CLAIMED IS:

1. A detection system for use during irradiation of an interaction region of a structure with laser light, the structure comprising embedded material, the detection system comprising:

a focusing lens positioned to receive light emitted from the interaction region;  
an optical fiber optically coupled to the focusing lens to receive light from the focusing lens; and

a spectrometer optically coupled to the optical fiber to receive light from the optical fiber, the spectrometer adapted for analysis of the light for indications of the embedded material within the interaction region.

2. The detection system of Claim 1, wherein the structure comprises concrete and the embedded material comprises rebar.

3. The detection system of Claim 1, wherein the spectrometer comprises:  
an optical grating adapted to separate the light into a spectrum of wavelengths;  
and

a light sensor optically coupled to the optical grating, the light sensor adapted to receive light in at least a portion of the spectrum and to generate a signal corresponding to an intensity of the received light.

4. The detection system of Claim 3, wherein the light sensor comprises a coupled-capacitance discharge camera system.

5. The detection system of Claim 1, further comprising at least one neutral density filter adapted to reduce the light received by the spectrometer.

6. The detection system of Claim 1, wherein the focusing lens is coaxial with the laser light impinging on the interaction region.

7. The detection system of Claim 1, wherein the focusing lens is off-axis with the laser light impinging on the interaction region.

8. The detection system of Claim 1, wherein the structure comprises concrete and the embedded material comprises rebar, and the spectrometer is adapted to analyze light having wavelengths of approximately 592 nanometers for indications of rebar within the interaction region.

9. The detection system of Claim 8, wherein the spectrometer is further adapted to analyze light having wavelengths of approximately 588.5 nanometers and approximately 593 nanometers by calculating a ratio of twice the intensity of light at 592 nanometers divided by the sum of the intensities at 588.5 nanometers and at 593 nanometers.

10. The detection system of Claim 9, wherein the ratio being greater than or equal to one corresponds to rebar within the interaction region.

11. A detection system for use during irradiation of an interaction region of a structure with laser light, the structure comprising embedded material, the detection system comprising:

means for focusing light emitted from the interaction region;

means for separating the focussed light into a spectrum of wavelengths; and

means for analyzing at least a portion of the spectrum for indications of embedded material within the interaction region.

12. A method of detecting rebar within a laser-irradiated interaction region of a structure comprising embedded material, the method comprising:

focussing light from the interaction region;

separating the light into a spectrum of wavelengths; and

analyzing at least a portion of the spectrum for indications of embedded material within the interaction region.